

1. (as amended) A method for cleaning one or more membranes normally immersed in [a] water [rich in] containing solids and used to produce a filtered permeate [a water lean in solids] comprising:

performing [cleaning events] at least once a week[, each cleaning event having] the steps of:

(a) stopping permeation;

(b) flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration; and,

(c) resuming permeation,

wherein

(d) the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations [of all cleaning events in] of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L; and,

(e) wherein the selected concentration, selected duration and sum of the products are selected to maintain an acceptable permeability or produce a gradual decline in permeability over extended periods of time.

2. (as amended) The method of claim 1 wherein the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations [of all cleaning events in] of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the

membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

3. (as amended) The method of claim 1 wherein the [water lean in solids] permeate is intended for drinking water and the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations [of all cleaning events in] of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

4. (as amended) The method of claim 1 wherein the water [rich in] containing solids is a wastewater and the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations [of all cleaning events in] of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

5. (as amended) A method for cleaning one or more membranes normally immersed in a water rich in solids in a tank and used to permeate a water lean in solids comprising:

performing cleaning events having the steps of:

- (a) stopping permeation;
- (b) flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate passes through the membranes in repeated pulses of a selected pulse duration [followed] separated

by waiting periods of a selected waiting period duration, the repeated pulses and waiting periods in a cleaning event cumulatively having a selected duration; and,

(c) resuming permeation;

wherein

(d) the membranes remain immersed in the water containing solids while the chemical cleaner flows through the membranes;

(e) the outside of the membranes is in fluid communication with the water containing solids.

(f) the selected pulse duration and selected waiting period duration is such that the chemical cleaner remains substantially effective during the waiting period despite decreasing in efficacy from an initial efficacy and is restored to the initial efficacy by the subsequent pulse.

(g) the membranes are not agitated while the chemical cleaner is flowed through the membranes.

7. (as amended) The method of claim 6 wherein [the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is] the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L.

8. (as amended) The method of claim 7 wherein [the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is] the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

9. (as amended) The method of claim 6 wherein the [water lean in solids] permeate is intended for drinking water and [the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is] the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

10. (as amended) The method of claim 6 wherein the water [rich in] containing solids is a wastewater and [the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is] the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps (b) in a week is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

18. (as amended) A method for cleaning one or more membranes immersed in water [rich in] containing solids and used to produce permeate [a water lean in solids wherein each cleaning event] comprises the steps of:

(a) stopping permeation and agitation of the water containing solids;
(b) flowing a cleaning chemical through the membranes to the outside of the membranes in a direction opposite to the direction in which permeate passes through the one or more membranes;

(c) resuming permeation; and,

(d) resuming agitation after resuming permeation,

and wherein permeate collected before resuming agitation is wasted or recycled to the water containing solids and wherein the membranes [and the membranes] remain immersed during steps (a), (b), (c) and (d).

19. (new) A method for cleaning one or more membranes normally immersed in water containing solids and used to produce a filtered permeate comprising:
performing at least once a week the steps of:

(a) stopping permeation;

(b) flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration; and,

(c) resuming permeation.

wherein

(d) the selected concentration of chemical cleaner is between about 20 mg/L and about 200 mg/L of chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy;

(e) the selected duration is between about 10 minutes and about 100 minutes; and,

(f) the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations [of all cleaning events in] of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L and maintains an acceptable permeability or gradual decline in permeability over extended periods of time.

20. (new) The method of claim 19 wherein the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide

chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

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21. (new) The method of claim 19 wherein the permeate is intended for drinking water and the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

22. (new) The method of claim 19 wherein the water containing solids is a wastewater and the sum of the products of the concentrations of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the durations of all of the steps of flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration in a week is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

23. (New) The method of any of claims 19 through 22 wherein

(a) the membranes remain immersed in the water containing solids while the chemical cleaner flows through the membranes;

(b) the outside of the membranes is in fluid communication with the water containing solids; and

(c) the membranes are not agitated while the chemical cleaner is flowed through the membranes.